NewsRelease

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SCIENCE ON THE VIEWING EDGE OF EARTH'S ATMOSPHERE

New NASA instrument to measure ozone, climate change

A new NASA remote-sensing satellite instrument took its first steps toward monitoring the health of the Earth's upper atmosphere yesterday. The Stratospheric Aerosol and Gas Experiment III (SAGE III) was launched successfully from the Baikonur Cosmodrome in Kazahkstan.

Developed and managed by NASA Langley Research Center, Hampton, Va., SAGE III aboard the Russian Meteor-3M spacecraft lifted off at p.m. EST on a Ukraine-built Zenit-2 Rocket. SAGE III will make precise measurements of ozone, aerosols, water vapor and other gases so researchers can better understand how and why the climate and ozone are changing. Scheduled for a three-year mission, the SAGE III/Meteor-3M is a joint partnership between NASA and the Russian Aviation and Space Agency (RASA).

After so many years of working on the SAGE III project, today has been a very exciting day for me, Langley and the entire SAGE III team," said Dr. William Chu, SAGE III project scientist. "So many people have worked very hard and should feel proud of this great accomplishment."

The SAGE III instrument uses a simple technique to provide complex information on the stratosphere -- its electronic "eye" watches sunsets, sunrises, moonsets and moonrises. Called occultation, the light from the sun and moon passes through the Earth's edge or atmospheric limb which SAGE III measures.

"SAGE III locks on to the sun or moon and, as the spacecraft goes behind the Earth, the instrument measures the dimming of that sunlight or moonlight caused by the Earth's atmosphere. By making these measurements in the correct color region, SAGE III produces accurate profiles of ozone or water vapor," said Dr. M. Patrick McCormick, SAGE III principal investigator and co-director for the Center of Atmospheric Sciences at Hampton University. "SAGE III's role is to provide long-term measurements of key components of the Earth's atmosphere vital for improved understanding of climate, climate change, and human-induced ozone chemistry and trends."

Ozone in the stratosphere is destroyed when it combines with chlorine, forming oxygen and chlorine monoxide. Most chlorine comes from the decay of human-made compounds known as chlorofluorocarbons (CFCs). CFCs came into use in the 1930s as refrigerants, later as blowing agents for creating foam insulation, and as industrial cleaning agents. The loss of stratospheric ozone means that more solar ultraviolet (UV) radiation reaches the Earth's surface. Since UV radiation has been linked to skin cancer, there is a human health risk posed by ozone depletion.

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Long-term record keeping has shown a rise in the average global temperature over recent decades while other observations show an increase in greenhouse gases and thinning of the stratospheric ozone layer. SAGE III's accurate, long-term measurements will be important for understanding the processes involved with climate change.

"The amount of harmful CFCs emitted into the atmosphere has lessened," McCormick said. "Are the policies regarding the reduction or elimination of CFCs that have been agreed to on a global basis working? Model predictions would say that within the next few years we should definitely see a slowdown in the thinning of the ozone layer. During the next ten years, we should start to see a thickening of this same ozone layer."

The SAGE III mission, a collaboration between NASA and RASA, extends a long-term working relationship between the United States and Russia to understand the Earth's environment. The SAGE III, built by Ball Aerospace in Boulder, Colo., is the only U.S. instrument included on the Meteor-3M payload.

According to Dr. Chip Trepte, SAGE III deputy project scientist from NASA Langley, working with the Russians has been a technical and cultural challenge. "It's been rewarding working with the Russians," said Trepte. "We had different approaches to working problems. It took additional time and effort to understand and work through these differences with the language barrier and our different cultures. In general, we have a common interest to understand how the climate works and try to find answers to problems that confront us."

Trepte added that NASA Langley workers are really quite excited about their role with SAGE III's evolution. "We developed the concept," Trepte added. "We oversaw the entire project from mission management to integration of the instrument aboard the Russian spacecraft. We're going to oversee the data collection and the production, and release the results to the public in a meaningful way."

In a recent visit to NASA Langley, the RASA Head of the Department of Space Remote Sensing, Dr. Leonid Makridenko, said the SAGE III/Meteor-3M mission has been an example of excellent cooperation between the United States and the Russian Federation. "This is a fine opportunity to unite the engineering and scientific skills of NASA and the Russian Space Agency," Makridenko said. "This optimizes the use of available resources for both sides as we share data and control of the instruments."

SAGE III will also measure aerosols (tiny particles floating in the air) from the middle troposphere (the atmospheric layer closest to Earth) through the stratosphere. Aerosol particles can absorb radiation from the sun and the Earth causing the atmosphere to warm or can scatter radiation back to space cooling Earth's atmosphere and surface. Aerosols can also influence chemical processes, including the control of ozone. SAGE III's predecessor, SAGE II, measured the dispersal of volcanic aerosols following the 1991 eruption of Mt. Pinatubo. These measurements were linked to a decline in the global averaged surface temperature in mid-1992 of about 1 degree Fahrenheit due to the large aerosol concentrations from the volcanic eruption.

The SAGE III instrument is part of NASA's Earth Science Enterprise, a long-term research effort being conducted to determine how human-induced and natural changes affect our global environment. . A second SAGE III instrument is scheduled to fly aboard the International Space Station in 2005.

For more information on-line:
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http://asd-www.larc.nasa.gov/ASDhomepage.html
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